Quantifying health and environmental impacts of air pollutants

Mike Holland (mike.holland@emrc.co.uk)

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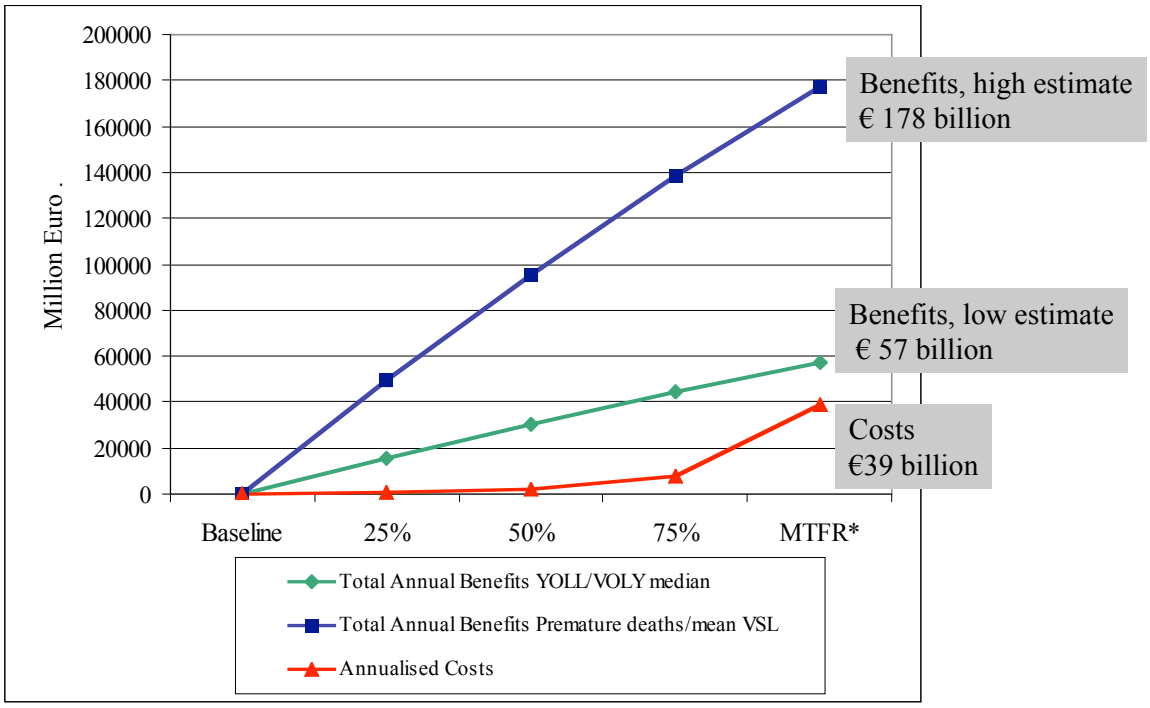
Damage to health, ecosystems and cultural heritage associated with emissions of fine particles, SO_2, NOx, VOCs and NH_3 has caused great concern in Europe for many years. Concerted international action to deal with the problem dates back 20 years to the ratification of the UNECE (United Nations Economic Commission for Europe) Convention on Long-Range Transboundary Air Pollution (CLRTAP). The European Union has also developed a substantial number of Directives since the mid-1980s that deal with air quality standards, emission standards for transport and stationary sources, product standards, and so on. These actions have led to major improvements in air quality, though impacts remain widespread and serious. Supporting analysis for European action has developed over the years from a simple assessment of emissions, to optimised cost-effectiveness using integrated assessment models, to cost-benefit analysis (CBA).

European CBA of air pollution policy was introduced around 1997, drawing on the European Commission's ExternE research programme. This has been supplemented recently by a major effort under the European Commission's Clean Air For Europe (CAFE) Programme to further refine methods in collaboration with WHO and other stakeholders from Member States, research organisations, environmental agencies, industry and NGOs. The new methods are now being applied to inform the development of the Commission's Thematic Strategy on Air Pollution, which will define directions for air quality regulation in the coming years.

The new CBA methods[1] quantify numerous effects on health, ozone effects on crops and damage to materials in utilitarian applications (as distinct from cultural heritage). Results are seen to be substantial when compared to the costs of pollution abatement generated by the RAINS model. The figure below compares a range for the benefits of emission control with the estimated costs of moving from forecast emissions in 2020 under current legislation to the maximum technically feasible reduction as estimated by the RAINS model. The range reflects uncertainty in the benefits assessment, chiefly in the quantification and valuation of mortality impacts.

Impacts to ecosystems, cultural heritage and a number of other receptors have not been quantified. These are integrated semi-quantitatively using 'extended CBA', a structured assessment that considers the nature of impacts, their severity across Europe, and the likelihood that each effect would add significantly to the benefits that are quantified through to monetary values. It is intended that decision makers will take a view on the extent to which these unquantified effects will affect the balance of costs and benefits when they consider how to respond to the findings of the analysis. It may, in future, be possible to formalise this more using multi-criteria analysis (MCA).

[1] Reports are available at www.cafe-cba.org



The CAFE work, along with similar studies in other parts of the world, notably North America, provides a solid foundation for CBA on a more global scale. In expanding the horizons of the analysis to other parts of the world, it will of course be essential to review the range of impacts covered, the pollutants addressed, response functions and valuations to ensure that they best reflect conditions in other parts of the world. Fortunately, there is already a large amount of research and policy analysis that will assist in this endeavour.